

STANDARDS DEVELOPMENT BRANCH CHIEF  
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*West Garafraxa*

**Township of West Garafraxa  
Police Village of Belwood**

**Gasoline Contamination of  
The Village Weaver Well**

**1970**

**L. V. Pitts**

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**TOWNSHIP OF WEST GARAFRANA, POLICE VILLAGE OF BELWOOD  
GASOLINE CONTAMINATION OF THE VILLAGE WEAVER WELL**

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**INTRODUCTION**

In a letter dated May 20, 1970, Mr. R. Cusod of The Village Weaver, requested the assistance of the Ontario Water Resources Commission in determining the cause of gasoline pollution in the company well at Belwood. The well is located in the Police Village of Belwood in lot 11, concession 7, in the Township of West Garafrana.

Hydrogeologic field studies were undertaken on June 1 and 22, 1970, which consisted essentially of an examination of local geologic and topographic features, the collection of water samples to determine ground-water quality and the extent of the gasoline pollution, and the determination of water-well locations.

Messrs. Robert Cusod, Robert Mitt, the Shell service station agent, and local residents were interviewed. The logs of water wells in the area were summarized from files of the Division of Water Resources. Figure 1 shows a map of the area and the relative locations of wells. The logs of wells are summarized in Table 1.

At the request of the Division of Water Resources, the Fuels Safety Section, Energy Branch, Ontario Department

of Labour, supervised air pressure tests on the Shell service station gasoline storage tanks.

## **WELLS**

The following information was gained from interviews with residents of the area. Because of the length of time which has elapsed since the pollution occurred, there may be some errors in the dates mentioned below.

Well 3 is reported to be over 100 years old and was formerly owned by the school at Belwood. The well became contaminated with gasoline in 1963. In an attempt to obtain uncontaminated supplies, it was deepened from 120 feet to 150 feet but a strong gasoline odour and taste in the water has persisted to the present time.

The Village Weaver acquired the school property in January of 1970 for commercial purposes. A supply of good quality water is required for making dyes. The well was not tested at the time of the purchase because of the winter season.

Mr. Cawood suspected that the cause of the gasoline pollution in his well was leaking underground gasoline storage tanks at a Shell service station which is located adjacent to his property.

Well 8, owned by Mr. J. Lavery, has produced water having a distinct gasoline odour since the property was purchased in 1968.

Reports of an old well on the Shell property which was reportedly abandoned because of gasoline contamination could not be confirmed.

Four to five years ago, a gasoline storage tank at the Shell service station developed a leak in the feeder pipe and the tank subsequently filled with water. It was pumped out and replaced with a new tank. Another tank had a small leak a few years ago but was subsequently repaired.

#### AIR TESTS ON UNDERGROUND STORAGE TANKS

Air pressure tests were carried out on the Shell underground gasoline storage tanks by the Ontario Department of Labour on June 7, 1970. The results indicated that a 1,000 gallon tank and connecting suction lines and two 300-gallon tanks, one containing water and the other gasoline and water, were defective.

#### GEOLGY

The Guelph formation of Middle Silurian age underlies the Belwood area and consists of cream and brown, fine to medium crystalline dolomite, containing numerous bioherm reefs. The Guelph formation is generally very permeable and porous, and is one of the major aquifers in southern Ontario. The overburden sediments consist mainly of glacial till in the form of plains and moraines which are overlain in some

areas by lane and spillway sand and gravel deposits of glacial origin.

## HYDROGEOLOGY

### Regional

The logs of water wells within a radius of about three miles of Belwood were studied to determine the general hydrogeologic characteristics of the area. Ground-water supplies are obtained from shallow, dug wells in the overburden or from drilled wells in the limestone bedrock. The overburden varies in thickness from about 200 feet in topographically high areas to less than 100 feet in topographically low areas. The bedrock surface is irregular in shape and has a regional slope to the southwest of about 15 feet per mile.

A contour map of the piezometric surface of the limestone aquifer was prepared from static water level and topographic data to determine the direction of ground-water flow in the Belwood area. The results indicate that ground water moves from areas of high topographic elevation toward discharge in the topographically low areas, such as the Grand River and Belwood Lake.

### Local

Domestic supplies of water in the Police Village of Belwood are obtained from shallow, dug wells in the

overburden and from drilled wells in the bedrock. The overburden is reported to vary in thickness from 35 feet to 76 feet and to consist mainly of clay and till with sand and gravel occurring at surface in some areas.

The static water levels of wells in Belwood could not be measured to define the direction of ground-water movement in the vicinity of The Village Weaver. However, from topographic observations and the contour map of the piezometric surface mentioned above, ground water in both the shallow overburden and in the bedrock is deduced to move southward from the Shell service station toward The Village Weaver property.

#### WATER QUALITY

The results of the chemical analysis of water samples collected from wells in Belwood are shown in Table 2.

The analyses show that the water from The Village Weaver and Leverty wells contained gasoline in concentrations of 12 ppm and 0.4 to 0.8 ppm, respectively. At the time of sampling, water from both wells had a distinct gasoline odour.

The high concentration of iron, 19.5 ppm, in the sample from The Village Weaver well is likely due to rust resulting from the deterioration of the well casing, pump, and/or system.

## **DISCUSSION**

There are two ways by which pollutants, originating at or near the ground surface, can enter aquifers. The first is by infiltration to the aquifer through the intervening overburden material and the second is by entry through an existing well which terminates in the aquifer.

In Belwood, it is unlikely that gasoline could infiltrate through the overburden as it comprises about 75 feet of relatively impervious clay and till. Therefore, it appears that gasoline entered the aquifer either through an abandoned well which was reported to be present on the Shell property, or by lateral movement to The Village Weaver well through the shallow overburden and into the well and the aquifer through a faulty casing. It also appears that the Lavery well was contaminated by gasoline which entered the aquifer in the vicinity of well 3 and moved downgradient in a southerly direction.

## **ALTERNATE SOURCES OF SUPPLY**

It may be possible to establish alternate sources of supply for The Village Weaver and J. Lavery, on their respective properties, by constructing shallow dug wells or deep drilled wells.

Shallow dug wells would be less expensive than deep drilled wells and appear to offer a better chance of obtaining



uncontaminated water. If a well is constructed for The Village Weaver, it should be located at the eastern corner of the property to minimize the possibility of obtaining gasoline-polluted water.

Wells drilled into the limestone bedrock might encounter water of acceptable quality from deeper aquifer zones. During well construction it would be necessary to seal off any contaminated zone by casing the zone and cementing the casing to surface. There is a possibility that deeper aquifers could also become polluted at a later time.

#### SUMMARY AND CONCLUSIONS

The Division of Water Resources was requested to conduct an investigation into the cause of gasoline pollution in The Village Weaver well in Belwood. In the course of the study, it was found that two wells in Belwood are contaminated by gasoline, The Village Weaver well and a well owned by Mr. J. Lavery.

Leaks from underground gasoline storage tanks at the local Shell service station have been reported on several occasions in the past and most recently in July and August, 1970, by the Ontario Department of Labour.

The two polluted wells obtain supplies from a bedrock aquifer in the Guelph formation. The bedrock is overlain

by about 50 feet of clay and glacial till. Sand and gravel deposits of glacio-fluvial origin occur locally.

Because of sparse static water-level data in the Police Village of Belwood, the direction of ground-water movement could not be defined exactly; but, from topographic observations and a map of the piezometric surface constructed for the Belwood area, the direction of movement is likely toward the south or from the Shell service station toward The Village Weaver and Lavery wells.

Based on these data, it appears that leaking underground gasoline storage tanks at the Shell service station have caused the gasoline pollution problem in The Village Weaver and Lavery wells. The pollutant may have entered the bedrock aquifer through an abandoned well reported on the Shell property and/or by migrating through the shallow overburden to The Village Weaver well and into the well and aquifer. Upon gaining access to the aquifer the gasoline appears to have moved southward under the influence of the natural ground-water gradient to the Lavery well.

Ramping polluted wells to waste is sometimes effective in reducing the level and spread of contamination in an aquifer. However, because of the length of time involved, this would likely be ineffective in this case. Alternate sources of water supply might be established for

The Village Weaver and J. Lavery by the construction of shallow dug wells or deep drilled wells on the respective properties, but extreme care must be exercised during construction to prevent contamination from reaching other aquifer zones.

#### **RECOMMENDATIONS**

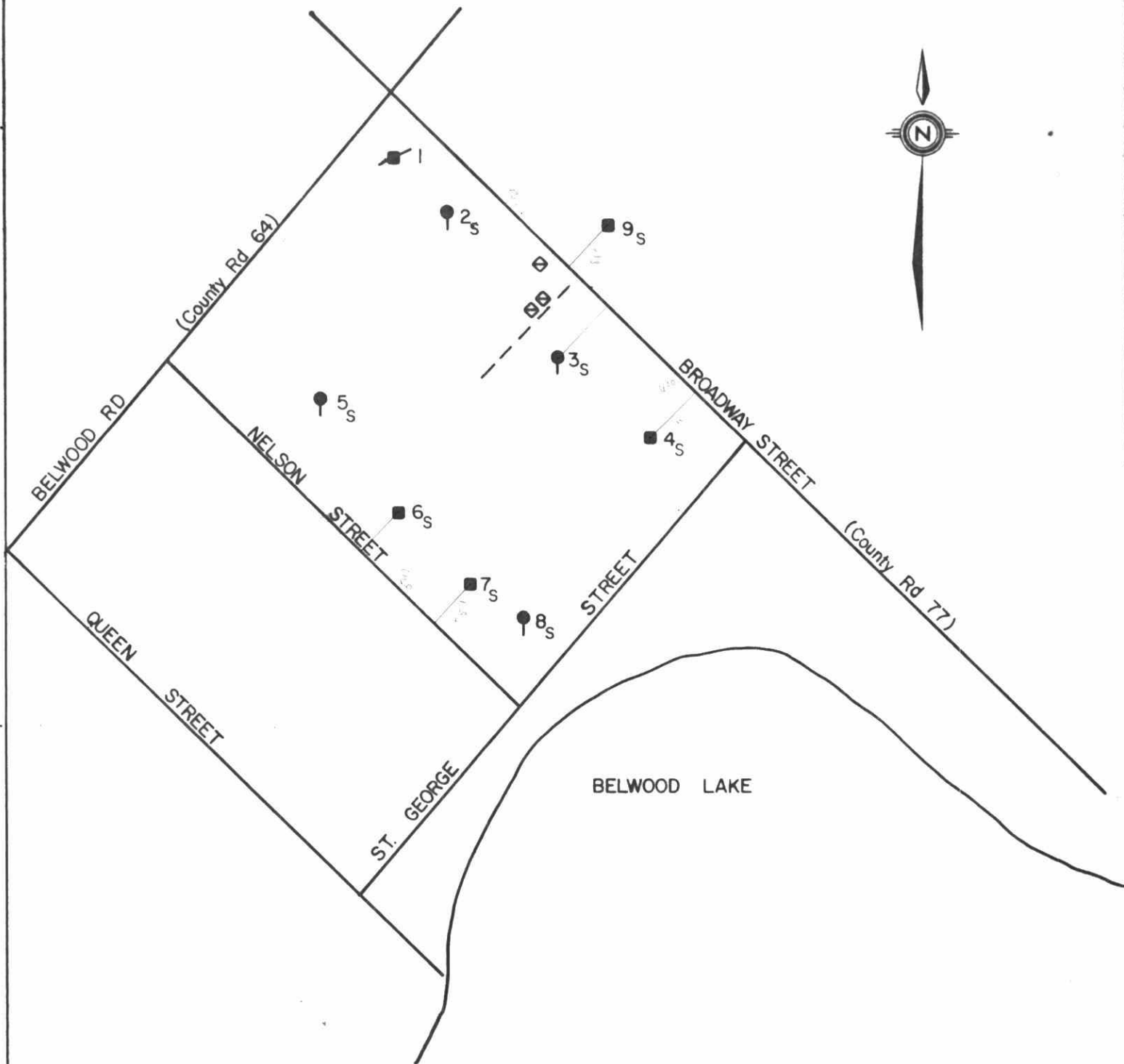
- 1) Alternate sources of supply for the affected people should be sought in areas outlined in this report.
- 2) The present Village Weaver well should be plugged and abandoned by pumping neat cement from the bottom of the well to surface.
- 3) If possible, the old well on the Shell property should be located and plugged in the above manner.
- 4) Defective gasoline storage tanks and suction lines at the Shell station should be repaired or replaced.

Prepared by: **L. V. Pitts, P. Eng.,**  
**Geologist,**  
**Surveys and Projects Branch.**

*L.V. Pitts*

*[Signature]*  
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LVP/lb  
30/09/70

*[Signature]*  
.....  
**T. J. Yakutich, Supervisor,**  
**Surveys and Projects Branch,**  
**Division of Water Resources.**



# **LEGEND**

- DRILLED WELL IN BEDROCK
- DUG WELL IN OVERBURDEN
- ABANDONED DUG WELL IN OVERBURDEN
- ◊ SHELL GASOLINE STORAGE TANKS
- S SAMPLED WELL

## **ONTARIO WATER RESOURCES COMMISSION**

### **TOWNSHIP OF WEST GARAFRAXA POLICE VILLAGE OF BELWOOD**

#### **Investigation of Gasoline Contamination of The Village Weaver Well**

DATE: Oct 1/70

SCALE:

DRAWING NO.

BY: SFS LVP

1 in = 200 ft

Figure 1

AREA OF SURVEY

Belwood

COUNTY

Wellington

## ONTARIO WATER RESOURCES COMMISSION

## TABLE OF WATER WELL RECORDS

TABLE 1

DATE

June 1/70

RECORDER

LUP

Well No.	Location	Owner	Driller	Well Type	Well Diameter	Depth	Static Level	Pumping Rate	Pumping Level	Quality	Use	Remarks, Log, etc.
1	Top of west Garafusa	A. Clark	—	□	36"	32	6.96	—	—	gasoline	Abandoned	about 10 years ago.
2	"	Chester Kirk	Cudney & Fouts 1957	●	4	153	35	8	65	F	D	0-76 cl. + hp 76-153 Ps. 150 *
3	"	The Village Weave	—	●	4	150	—	—	—	gasoline	E	well reported contaminated 120 feet deep at time of contamination 6-7 yrs ago, drilled to 150 feet.
4	"	F. Bellamy	—	■	36	25	—	—	—	F	D	stone-cribbed good supply
5	"	Top. of west Garafusa	J. Cudney 1966	●	4	145	22	11	30	F	Leakage	0-72 Stoney cl. 72-145 soft yw. ls 145 *
6	"	J. Milne	—	■	36	20	—	—	—	F	D	good supply well 100 yrs old

AREA OF SURVEY Belwood  
COUNTY Wellington

RECORDER LVP

**TABLE OF WATER WELL RECORDS**  
**TABLE 1 (Con't.)**

COUNTY Wellington

TABLE 1 (CON'T.)

Well No.	Location			Owner	Driller	Well Type	Well Diameter	Depth	Static Level	Pumping Rate	Pumping Level	Quality	Use	Remarks, Log, etc.
7	Top of West Gona	7	"	M. Sargent	—	■	36	30	-	-	-	F	D	old dry well good supply
5	"	7	"	C. Gerrie New owner Belwood Marina - J. Hawerty	Cudney & Foots 1957	●	4	69	15	9	23	F	D	0-35 clay 35-69 ls 69*
	# 2972													
9	"	8	"	C.M. Connolly	—	■	36	50	-	-	-	F	D	well is done - cribb good supply

ONTARIO WATER RESOURCES COMMISSION  
CHEMICAL LABORATORIES

**WATER ANALYSIS**  
**TABLE 2**

1 p.p.m. = 1 mgm. / litre  
= 1 lb. / 100,000 Imp. Gals.

All analyses except pH reported in  
p.p.m. unless otherwise indicated

Municipality: Township of Garafraxa West      Report to: L. Pitts - Div. of Water Resources      c.c. A. Redekopp  
P. Diosady  
Central Files

Source: Police Village of Belwood Wells      G. Rees

Date Sampled: June 1/70      by: LVP b

Lab. No.	Hardness as CaCO <sub>3</sub>	Alkalinity as CaCO <sub>3</sub>	Iron as Fe	Chloride as Cl	pH at Lab.	Fluoride as F	Apparent Colour Units	Turbidity Units	Sulphate as SO <sub>4</sub>	Calcium as Ca	Odour on arrival
W 23-25	654.	403	19.5	253	7.0				16	176.	Faint gasoline
W 23-26	208.	197	0.05	8	7.8				59	43.	nil
W 23-27	500.	307	0.05	40	7.3				61	157.	nil
	Magnesium as Mg	Sodium as Na		Potassium as K					Phenols		Identification possible gasoline
W 23-25	51.	73		1.9		70	** Gasoline residue was detected at a level of 12 ppm in this sample.			**	
W 23-26	24.	31		1.4		5				--	
W 23-27	26.	23		8.3		3				--	
W 23-25	1 A,D. Village Weaver's Well - Belwood										
W 23-26	2A, B. Kirk Well - Belwood										
W 23-27	3 A,B. C.M. Connolly - Belwood										

ONTARIO WATER RESOURCES COMMISSION  
CHEMICAL LABORATORIES

Page 1 of 2

All analyses except pH reported in  
p.p.m. unless otherwise indicated

WATER ANALYSIS  
TABLE 2 (Con't.)

1 p.p.m. = 1 mgm. / litre  
= 1 lb./100,000 Imp. Gals.

Municipality: Police Village of Belwood		Report to: L.V. Pitts - Div. of Water Resources c.c.		A.B. Redekopp Central Files	
Source: Twp. of West Garafraxa Wells		/rd			
Date Sampled: June 1/70		by: L.V. Pitts			

Lab. No.	Phenols in ppb	Identification of Phenol	Sulphate as SO <sub>4</sub>	Calcium as Ca.	Magnesium as Mg.	Sodium as Na.	Potassium as K.	Odour On Arrival.				
W23-28	0	-----	48	161	71	29	4.9	Nil				
W23-29	0	-----	28	106	26	13	6.2	Nil				
W23-30	7	-----	27	108	27	5	2.1	Nil				
W23-31	8	-----	42	34	15	37	1.1	Nil				
W23-32	2	-----	38	110.	29.	44	7.0	Nil				
see page 2 of 2 for other results.												

W23-28	4.	F. Bellamy, Belwood.
W23-29	5.	J. Milne, Belwood.
W23-30	6.	M. Sargent, Belwood.
W23-31	7 A & B	J. Laverty, Belwood <sup>Marina</sup> <del>Marina</del>
W23-32	8 A & B	Well 2976 - Twp. of West Garafraxa



ONTARIO WATER RESOURCES COMMISSION  
CHEMICAL LABORATORIES

TABLE 2 (Con't.)

WATER ANALYSIS

All analyses except pH reported in  
p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre  
= 1 lb./100,000 Imp. Gals.

Municipality: Police Village of Belwood Report to: L.V. Pitts - Div. of Water Resources c.c. A.B. Redekopp  
Central Files

Source: Twp. of West Garafraxa Wells

Date Sampled: June 1/70 by: L.V. Pitts

/rd

Lab. No.	Hardness as CaCO <sub>3</sub>	Alkalinity as CaCO <sub>3</sub>	Iron as Fe.	Chloride as Cl.	pH at Lab.								
W23-28	700.	445	0.60	170	7.3								
W23-29	374	292	0.05	52	7.5								
W23-30	382	326	0.05	25	7.5								
W23- <sup>3</sup> <del>41</del>	148	168	0.10	8	7.8								
W23-32	394	273	0.30	114	7.5								

See page 1 of 2.

**ONTARIO WATER RESOURCES COMMISSION  
CHEMICAL LABORATORIES**

**ORGANIC ANALYSIS**

**TABLE 2 (Con't.)**

All analyses except pH reported in  
p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre  
= 1 lb./100,000 Imp. Gale.

**Municipality:** Twp. of West Garafrana  
3x2

**Report to:** L.V. Pitts, Div. of Water Resources  
O.W.R.C., 135 St. Clair Ave. W., Toronto

**c.c. Central Files**

**Source:** Well  
Police Village of Bellwood

cc G. Rees

**Date Sampled:** June 22/70 **by:** L.V.P.

Lab. No.	Gasoline	Odour on Arrival											
0-1533	0.8 ppm	*											
0-1534	0.4 ppm	*											
0-1535	0.6 ppm	*											
0-1536	0.6 ppm	*											
* Slight petroleum odour													
Samples were analysed for gasoline residues by gas chromatography. The presence of relatively large concentrations of low boiling hydrocarbons, indicate a fairly recent contamination.													
Detection limit - 0.1 ppm gasoline residue													
0-1533	1A	Well 2972, Belwood Marina											
0-1534	1B												
0-1535	1C												
0-1536	1D												